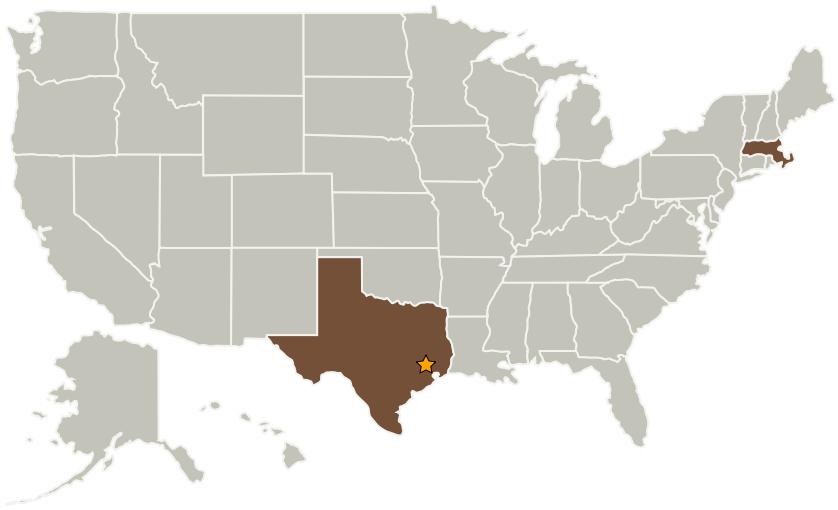
Tissue-Equivalent Radiation Dosimeter-On-A-Chip, Phase I

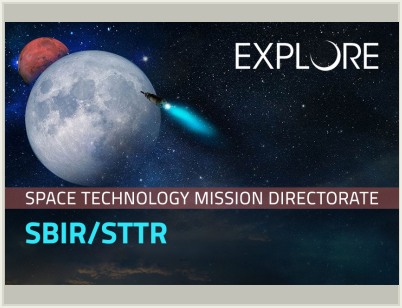
Completed Technology Project (2007 - 2007)

Project Introduction

Many commercially available digital dosimeters are bulky and are unable to properly measure dose for space radiation. The complexity of space flight design requires reliable, fault-tolerant equipment with the capability of providing real-time dose readings during a mission, which is not feasible with the existing thermo-luminescent dosimeter (TLD) technology. The project will create a compact, lightweight, energy-efficient dose meter comprised of a tissue-equivalent scintillation crystal coupled to a solid-state photomultiplier (SSPM), which is an array of CMOS photodiodes, operated in Geiger avalanche mode. The ubiquitous nature of CMOS technology provides a standardized development platform, and the ability to integrate all the supporting electronics into a miniature, simple design. In Phase I, we will model the expected dosimeter performance and characterize the performance of a prototype dosimeter exposed to high-energy protons, which simulates radiation in the space environment. We will also determine the TLD-dose equivalence of our measurements. In Phase II, we will create the support software and design and fabricate a finalized chip that includes readout electronics, power supply, memory storage, and other interfacing components.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Radiation Monitoring Devices, Inc.	Supporting Organization	Industry	Watertown, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.4 High Performance Memories